while *M. cephalus* shuns it though both of them abound in the lake in autumn/winter months when they form a good fishery.

CENTRAL INLAND FISHERIES
RESEARCH INSTITUTE,
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A. V. NATARAJAN
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18. THE COCONUT CRAB *BIRGUS LATRO* (L.) (CRUSTACEA: PAGURIDAE) IN THE GREAT NICOBAR ISLAND

(With a photograph and four text-figures)

During the expedition to Great Nicobar Island in February-May 1966, one of us (A.D.) had the opportunity to collect, and observe the habits of the well-known Coconut or Robber Crab [*Birgus latro* (L.)], which appeared to be common at Galathea Bay in this island. A number of berried females were also obtained and attempts to hatch the eggs in the camp laboratory were partially successful. The present note is based on the observations on, and collection of, *Birgus latro* from the Great Nicobar Island.

MATERIAL

In addition to the specimens dissected in the camp laboratory, the following preserved specimens were brought back to Calcutta for confirming the identification. Measurements are given in millimetres.

1. One female with eggs from Stn. No. 6, Galathea Bay, Great Nicobar Island. Collection No. 469. Date 20-3-1966.
   Carapace (Cephalothorax) length—115 (Cephalic region 62, Thoracic region 53).
   Carapace breadth—124.
2. One female from Stn. No. 7, on way to Pygmalion Point from Galathea Bay, Great Nicobar Island. Collection No. 531. Date 22-3-1966.
   Carapace (Cephalothorax) length—138 (Cephalic region 71, Thoracic region 67).
   Carapace breadth—144.
3. One female with eggs from Stn. No. 6, Galathea Bay, Great Nicobar Island. Collection No. 628. Date 25-3-1966.
   Carapace (Cephalothorax) length—99.5 (Cephalic region 53.5, Thoracic region 46.0).
   Carapace breadth—110.

Although the Zoological Survey of India party made extensive survey of the coastal areas of the island and made numerous traverses in the interior, the coconut crabs were found only at Galathea Bay. In the opinion of the coastal Nicobarese this crab occurs at Galathea Bay only.

Distribution

The general distribution of *B. latro* has been discussed in detail by Reyne (1939). Its distribution in New Guinea has been given by Holthuis (1959, 1963) and in Dutch East Indies by Reyne (1938). In the Indian Ocean north of the equator, it is represented only on the South Sentinel Island, Andamans (Alcock 1905) and on the Nicobar Islands (Hume 1874; Alcock 1902, 1905; Man 1932).

Habitat

B. latro is mainly nocturnal in habit and very shy. They were never seen during the day. In Galathea Bay, they were observed under fallen trees and between roots of trees at night, clinging to the roots of Pandanus and *Barringtonia* trees, arecanut and coconut palms and also in burrows and holes among coral rocks well above high tide mark where the forest extended up to the supralittoral fringe region.

Habits

According to coastal Nicobarese of Galathea Bay region, the crabs are crepuscular and nocturnal hiding during the day except on very cloudy and rainy days. They are said to stay in their burrows even in moonlit nights and seem to be active only in total darkness. All the specimens collected by the Z.S.I. party were obtained after 7 p.m.

Food habits. The food habits of *Birgus* were studied by (i) direct observation, (ii) examination of stomach contents of newly caught animals, (iii) examination of food remains in places where the crab lives, and (iv) feeding experiments.

(i) *Direct observation:* Direct observation on the food habits is very difficult because of the nocturnal habits and shy nature of these animals. As indicated by Reyne (1939), very few observations have been made by naturalists under these conditions. These giant crabs were seen on several occasions clinging to partially eaten Pandanus,

Barringtonia and arecanut fruits and on two occasions actually eating the fruits. In one instance a female crab was eating dead Ocypodid crabs which occur abundantly on the island. Although there are many previous records of this giant pagurid opening coconuts and eating them, attempts on the present occasion to confirm this habit were not successful. The coastal Nicobarese do not think that these crabs eat coconuts at all. In their opinion the damage to the coconuts has been wrongly attributed to these crabs, while the actual culprits are rats.

(ii) *Examination of stomach contents:* Stomachs of newly caught animals contained *Barringtonia*, Pandanus and arecanut fruits which appear to form a major source of food for the crabs. In one instance partially digested remains of a crab were also noticed.

(iii) *Examination of food remains:* The fibres of arecanut husk, partially eaten fruits of *Barringtonia* and Pandanus stacked at the entrance of numerous holes where these crabs live appear to indicate that these crabs eat *Barringtonia* and Pandanus fruits and arecanuts. In one instance the fibres of coconut husk also was observed at the entrance of a crab hole.

(iv) *Feeding experiments:* In captivity the crabs accepted cooked rice, chapathis, bananas and also coconut kernel. As pointed out by Reyne (1939) this, however, is no certain proof that coconut is also eaten under natural conditions.

Climbing habits. The ability of coconut crabs to climb coconut palms was determined as follows:—

A specimen obtained on March 19, 1966 at 10·30 p.m. was tied to a string and left at the base of a coconut palm. It backed up the palm when the lights were put off. In climbing the crab supported its body with the fourth pair of walking legs clinging to the trunk by means of its long and sharply pointed second and third pair of walking legs. It had reached the top by 2 a.m. and by 3 a.m. had nipped off the string by which it was tied. The crab stayed on the top of the palm throughout the next day without much apparent activity. At 7 p.m. on 20th, it let itself fall down to the ground, and hurried to the sea-shore where it hid itself underneath a boulder in the supralittoral fringe region. Examination of the crown of the palm where the crab had stayed revealed that it had cut away the tender shoots and had probably eaten them. None of the coconuts were damaged.

On 22 March 1966, a coconut crab was obtained at 7.30 p.m. It was raining and had become very dark by this time. The crab was tied to a string and was left at the base of another coconut palm at 8 p.m. It stayed at the base for nearly an hour and then started climbing upwards and by 8.30 p.m. had climbed 4 metres. Seeing an obstacle (kept there previously), it moved laterally to avoid it and resumed its climb reaching the top by 11.45 p.m. and by 3 a.m. it had cut away the string by which it was tied. At 8 a.m. on 23rd it jumped down apparently without injury. As this coconut palm was at the high tide mark with its trunk bending towards the sea the crab jumped down into water in the inshore region, swam and then hid itself in the crevices of corals.

Two specimens of *Birgus* (a male and a female) were tied and left at the base of a coconut palm on 23 March at 8 p.m. Both crabs climbed the palm (photograph) and reached its top by 10 p.m. By 11 p.m. one crab had snapped the string and by midnight the

Birgus latro climbing palm

other one had also freed itself. These crabs stayed on top of the palm till 1 p.m. the next day. The berried female specimen jumped from the palm into the inshore area and was caught and kept on a meshed tray over a bowl filled with sea-water. After sometime it was observed that numerous zoeae were released into the water. The male crab remained on top of the palm and was retrieved the following day.

In none of the observations made did the crabs attempt to break open coconuts and eat them and only the tender shoots of coconut palm were damaged.

Other observations :

In several experiments where specimens of *Birgus* and coconuts were together in dark chambers the crabs did not touch the coconuts. However when they were offered the kernel of coconut they readily ate them.

On March 23, 1966 a female *Birgus* caught hold of the nose of a pig which was being reared by the coastal Nicobarese. The squealing of the pig attracted our attention and the crab was caught. It is quite probable that the pig had attempted to eat the robber crab and that the crab had caught hold of its nose in self protection. It is not out of place to mention here Holthuis's remark (Holthuis 1959) based on the information of Mr. Rappard on *Birgus* of Podena and Kumamta Islands, that '*Birgus* had disappeared from that island presumably as the result of the installation of a pig farm there; the robber crabs, which had been plentiful before, had disappeared entirely after the introduction of the pigs'.

Breeding Habits

Eggs and hatching-stage larvae :

As pointed out earlier a berried female specimen was kept on a meshed tray over a bowl filled with sea-water. The eggs are borne in grape-like bunches (Fig. 1) between the biramous limbs of second third and fourth abdominal segments. The details of this attachment to the long hairs of the biramous limbs have been described in detail by Borradaile (1900). These eggs are ellipsoidal in shape (Fig. 2) and measure 1·5 mm. in length and 0·92 mm. in breadth in live condition.

The female releases the eggs just before hatching and zoea larvae emerge within a few minutes. The zoea larva (Figs. 3 & 4) has a total length of 4·1 mm. and resembles the pagurine zoea as described by Borradaile (1900) and Harms (1932). Further developmental stages could not be studied.

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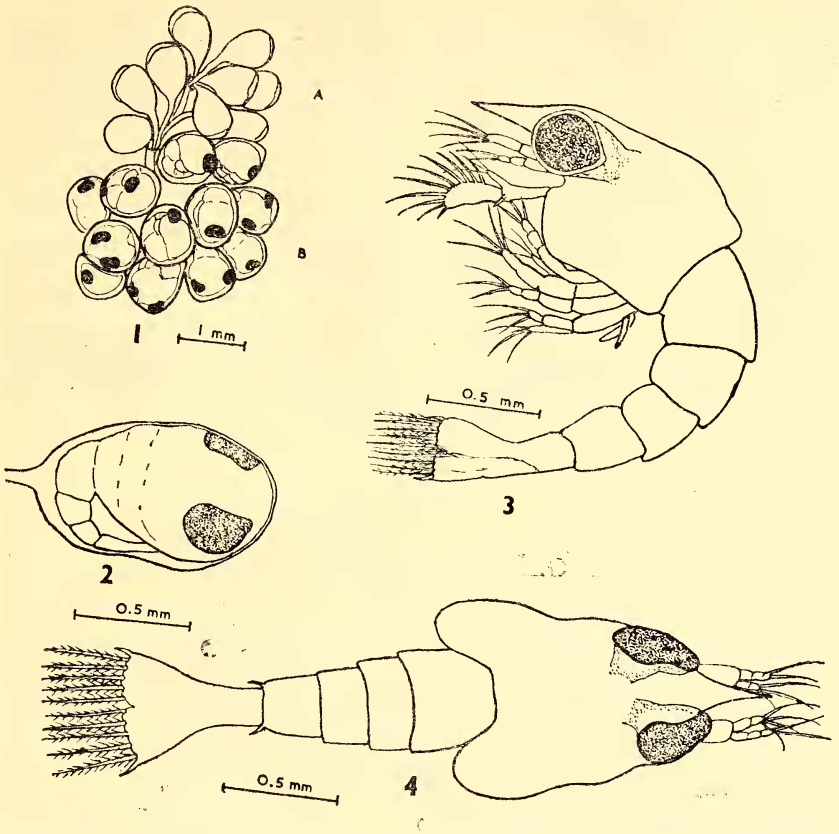

Fig. 1. Bunch of eggs of *Birgus latro* (L.) showing (A) empty cases after the larvae have emerged out and (B) eggs just before hatching ; Fig. 2. Lateral view of egg just before hatching ; Fig. 3. Zoea larva—lateral view ; Fig. 4. Zoea larva—dorsal view.

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19. GENITALIA OF BUTTERFLIES OF THE HESPERIID GENUS *CALTORIS* AS FIGURED BY EVANS

The usual method of identifying an unknown Hesperiid is to dissect and search among the excellent genitalia plates in Evans' CATALOGUE OF THE HESPERIIDAE OF EUROPE, ASIA AND AUSTRALIA (1949). The figures for *Caltoris* present special difficulties. This is unfortunate as many species can be certainly determined only by dissection. The clasps are well drawn though the distal end of the valva of *tenuis* is broader than is shown. Yet the clasps are so alike sometimes that distinguishing is not easy. Differences in the aedeagus are clearly shown. The gnathos and uncus cause the trouble. They are fused and cannot be adequately drawn. On the dorsum is a pair of spurs (wings) of which Evans shows the left one in his side view. Only one side view, that of *confusa*, is faulty: the distal end should resemble that of *bromus* but the spur (covered with hairs) has both a short base and a conspicuous projection rather like *cahira*.

The gnathos presents two thin edges in the ventral view, which become thicker half way up and usually end in expanded tips. Tips are not expanded in *cahira* nor in *tenuis* (the two small circles in Evans are accidents of drawing) nor in *kumara kumara* (the circles in Evans' figure contradict his key and his dissections). In *kumara moorei* (not figured in Evans) the tips of the gnathos and also those